

RD-A170 851

A CASE SERIES OF HUMAN RABIES EXPOSURES FROM DOMESTIC
VERSUS WILD ANIMALS. (U) AIR FORCE INST OF TECH

1/1

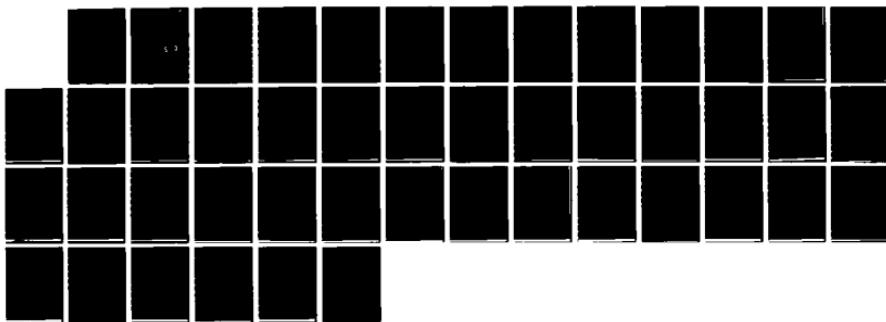
WRIGHT-PATTERSON AFB OH S C GOODELL 1986

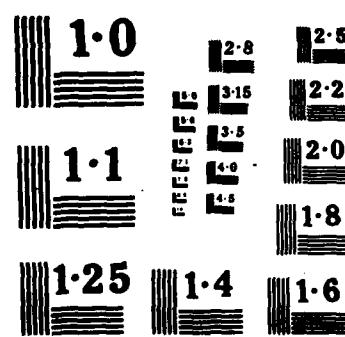
UNCLASSIFIED

AFIT/CI/NR-86-118T

F/G 6/5

NL





SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AFIT/CI/NR 86-110T	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) A Case Series of Human Rabies Exposures From Domestic versus Wild Animals in San Antonio, Texas, and Unincorporated Bexar County 1982-1985		5. TYPE OF REPORT & PERIOD COVERED THESIS/DISSERTATION
7. AUTHOR(s) Stephen Curtis Goodell		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS AFIT STUDENT AT: University of Texas		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS AFIT/NR WPAFB OH 45433-6583		12. REPORT DATE 1986
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES 43
		15. SECURITY CLASS. (of this report) UNCLAS
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES APPROVED FOR PUBLIC RELEASE: IAW AFR 190-1		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

48 DTIC
S ELECTED AUG 13 1986 D
E

Lynn Wolaver 6 Aug 86
Dean for Research and
Professional Development
AFIT/NR

ATTACHED.

DTIC FILE COPY

A CASE SERIES OF HUMAN RABIES EXPOSURES FROM DOMESTIC
VERSUS WILD ANIMALS IN SAN ANTONIO, TEXAS, AND
UNINCORPORATED BEXAR COUNTY 1982-1985

BY

STEPHEN CURTIS GOODELL, R.N., BSN

STEPHEN C. GOODELL
CAPT
Environmental Health Nurse Program
USAF Nurse Corps
1986
43 pages
Masters of Public Health
University of Texas Health Science Center
at Houston School of Public Health

Accession For	
NTIS GRA&I <input checked="" type="checkbox"/>	
DTIC TAB <input type="checkbox"/>	
Unannounced <input type="checkbox"/>	
Justification _____	
By _____	
Distribution/ _____	
Availability Codes _____	
Dist	Avail and/or Special
A-1	



A CASE SERIES OF HUMAN RABIES EXPOSURES FROM DOMESTIC
VERSUS WILD ANIMALS IN SAN ANTONIO, TEXAS, AND
UNINCORPORATED BEXAR COUNTY 1982-1985

STEPHEN CURTIS GOODELL, R.N., BSN
The University of Texas
Health Science Center at Houston
School of Public Health, 1986

Supervising Professor: Dr. Clayton W. Eifler

Rabies is a zoonotic virus which is commonly transmitted to humans by an animal bite. Since this disease is almost always fatal, control measures have been mainly preventative, consisting of stringent animal control programs, domestic cat and dog vaccination programs, and the liberal use of human diploid cell vaccine. In 1983, however, two cases of human rabies in United States citizens occurred which were attributed to inadequacies in both the animal and human vaccines. Therefore, it appears that emphasis must be placed on animal control programs in order to prevent initial rabies exposures. For this study, a systematic examination of animal bite reports from the San Antonio Metropolitan Health District will be performed. Results of this examination will be used to make recommendations regarding the community's present animal control program.

A CASE SERIES OF HUMAN RABIES EXPOSURES FROM DOMESTIC
VERSUS WILD ANIMALS IN SAN ANTONIO, TEXAS, AND
UNINCORPORATED BEXAR COUNTY 1982-1985

BY

STEPHEN CURTIS GOODELL, R.N., BSN

APPROVED

Clayton W. Eifler

Clayton W. Eifler, Ph.D.

Spurgeon Neel
Spurgeon Neel, M.D.

ACKNOWLEDGEMENTS

I would like to express my gratitude to my wife, Sheila. Much more than love, honor, and devotion, Sheila has provided many critical comments and an abundance of support during the preparation of this project.

A special thanks to my advisory committee, Dr. Clayton W. Eifler and Dr. Spurgeon Neel for their encouragement to continue with the project as well as their support and advice throughout the course of study.

Finally a note of gratitude to Gwen Haggard for her patience and assistance with technical details of the project.

Submitted May 5, 1986

A CASE SERIES OF HUMAN RABIES EXPOSURES FROM DOMESTIC
VERSUS WILD ANIMALS IN SAN ANTONIO, TEXAS, AND
UNINCORPORATED BEXAR COUNTY 1982-1985

STEPHEN CURTIS GOODELL, R.N., BSN
The University of Texas
Health Science Center at Houston
School of Public Health, 1986

Supervising Professor: Dr. Clayton W. Eifler

Rabies is a zoonotic virus which is commonly transmitted to humans by an animal bite. Since this disease is almost always fatal, control measures have been mainly preventative, consisting of stringent animal control programs, domestic cat and dog vaccination programs, and the liberal use of human diploid cell vaccine. In 1983, however, two cases of human rabies in United States citizens occurred which were attributed to inadequacies in both the animal and human vaccines. Therefore, it appears that emphasis must be placed on animal control programs in order to prevent initial rabies exposures. For this study, a systematic examination of animal bite reports from the San Antonio Metropolitan Health District will be performed. Results of this examination will be used to make recommendations regarding the community's present animal control program.

TABLE OF CONTENTS

Acknowledgements.....	iii
Abstract.....	iv
Chapter I	
Introduction.....	1
Hypothesis.....	5
Study Objectives.....	5
Review of Literature.....	7
Summary.....	13
Chapter II	
Methodology.....	16
Chapter III	
Study Validity and Reliability.....	19
Analysis of Data.....	20
Results.....	21
Expectations for Results.....	21
Chapter IV	
Discussion.....	23
Chapter V	
Conclusions and Recommendations.....	26
Appendices	
Appendix 1: Definition of Terms.....	28
Appendix 2: Budget of Time and Resources.....	29
Appendix 3: Animal Bite Report Checklist.....	31
Appendix 4: Sample Letter to be sent to Metropolitan Health District.....	33
Appendix 5: Copy of Animal Bite Report.....	34
Bibliography.....	35
Vita.....	38

CHAPTER I

Introduction:

Rabies is one of the oldest known human diseases, dating back to the 20th century B.C., where cases have been found in Babylonian writings. Rabies is an infectious disease, which affects the central nervous system of an infected host. Progression of the disease almost always results in death.

The survival of the rabies virus through time has been possible because of its ability to be maintained and spread by certain wild and domestic animals. Transmission of rabies is almost always from the bite of an infected animal to a non-infected animal or person. This is due to the fact that the virus is commonly carried in oral secretions--from saliva and the respiratory tract.(20)

Prior to 1980, treatment for potential human rabies exposure consisted of vaccination using the duck embryo vaccine. This vaccine required a person who had been potentially exposed to rabies to receive up to 23 doses (intramuscular shots). The vaccine also had an eight percent failure rate in producing immunity, caused systemic allergic reactions in one third of those treated, and produced

anaphylactic shock in approximately one percent of the cases.

However, since 1980, treatment of potential human rabies exposure has improved. Today, the human diploid cell vaccine (HDCV) is the treatment of choice. Unlike the duck embryo vaccine, HDCV has fewer adverse side effects. Less than 0.1 percent of those treated with this vaccine develop reactions considered to be serious. None of these reactions have been permanent. HDCV is also less oppressive for the patient, as it requires only five doses, is not inordinantly painful, and is considered to be 100 percent effective. When the first dose of HDCV is given, a separate dose of rabies immunoglobulin is also given. This provides immediate therapeutic levels of rabies antibodies while the body's immune system is responding to the HDCV.(12)

Prevention of rabies in the United States has also changed, especially over the past forty years. This is primarily due to animal control measures which were implemented in the 1940's. As a result of those measures, reports of human rabies in this country decreased from 73 cases in 1936 to 3 cases in 1984. There was also a decline during this time in domestic animal rabies. This occurred even though the numbers of wild animal rabies remained constant.(3,24) However, even with this decline, approximately 30,000 people in the United States are treated annually for possible exposure to rabies resulting from both wild and domestic animal attacks.(7) In addition, a world

survey for the World Health Organization reported that the number of reported human deaths from rabies for 1982 was 1217 and for 1983 was 1117.(28) As these statistics indicate, even with our increased understanding of rabies, the disease continues to exist as a serious and deadly threat to our society today.

In order to better understand the complexity of factors inherent in potential human rabies exposures, examination of exposure from offending animal to human is essential. This can take two forms. First, exposure from domestic animal attacks must be examined. Second, exposure from wild animal attacks must be examined.

Domestic animal attacks are a known public health problem in this country today. Over one million cases of domestic animal bites are reported annually, with dogs as the offending animal in 90 percent of the cases. These bites are responsible for approximately one percent of all visits to emergency departments. Usually the offending animal is owned by the victim or by someone known to the victim. In most cases, the victim is a child who has in some way provoked the animal to attack. While cats and dogs are required to be vaccinated against rabies, compliance with pet regulations is not always assured.(9,11,13,23,24)

In order to assure adequate protection, it is vital that the animal vaccination be performed by a qualified veterinarian. This is due to the fact that vaccines are

susceptible to loss of potency through mishandling.(11) Also, there is a one month post vaccination period that occurs before immunity to rabies is established. During this one month time period, newly vaccinated animals should be protected from possible rabies exposures, and humans bitten by these animals should not assume immunity. An example of this type of failure occurred in 1983. The CDC reported a human rabies case in which the disease was presumed to have been contracted from a bite of a recently vaccinated dog. Therefore, regardless of the rabies vaccine status of the offending animal (unless the offending animal is proven negative for rabies by either tissue examination or quarantine), the individual should always be considered potentially at risk and should receive rabies postexposure prophylaxis.(3,5,8)

Unlike domestic animals, wild animals are of unknown rabies status. Therefore, attacks by wild animals are considered and treated as positive rabies exposures unless the animal has been captured and tested as negative.(18) While the magnitude of possible human rabies exposure from wild animals is undefined, the problem is one that can easily escalate as man increasingly encroaches on wild animal habitats. As a result, attention must continually be given to the threat of rabies from wild animal attacks.

A review of the literature reveals that there is little current information available on the circumstances

surrounding human rabies exposures from both wild and domestic animals. Yet, defining the circumstances surrounding an animal attack may yield important information for preventing human exposure to rabies. It is the purpose of this proposed study to ascertain the frequency of reported potential human rabies exposures from wild animals as compared to that from domestic animals, and to examine other factors involved in these exposures. This will be accomplished by examination of animal bite reports from a predetermined community.

Hypothesis:

From the examination of the animal bite reports, two specific results are expected. First, animal bite reports involving domestic animal attacks will outnumber those involving wild animal attacks. This expectation is based on the reasoning that humans come into contact more frequently with domestic animals than with wild animals. Yet, even though this may be true, human rabies exposure will be higher for wild animal attacks than for domestic animal attacks.

Second, upon examination of both wild and domestic animal attacks, similarities and differences between the two types of attacks will be evident.

Study Objectives:

The objective of this study is to better understand the complexity of factors inherent in human rabies exposures,

so that effective and efficient animal control measures may be designed and implemented for a community. To meet this objective, examination of exposure from offending animal to human is essential. This will be accomplished through an examination of animal bite reports in a predetermined community. This examination will ascertain the frequency of reported human rabies exposures from wild animals as compared to that from domestic animals, and also describe contributing factors in each of the attacks. In order to assure proper interpretation of exposures, the following factors will be included in the examination of the animal bite reports:

1. Is the frequency of reported rabies exposures from wild animals higher than that from domestic animals?
2. Are the majority of attacks provoked or unprovoked by the individual involved?
3. What area of the body was affected in the attack?
4. How was the individual exposed (ie. bite, scratch, contact with saliva, etc.)?
5. What species of animal(s) is most frequently responsible in the majority of attacks?
6. For the geographic area of study, what species of animal is most frequently found rabid?
7. What was the vaccination status of the offending animal?
8. What was the vaccination status of the victim?
9. What was the age and gender of the individual that was attacked?
10. If the animal was a domestic dog, what breed was it? Was the dog large or small?
11. If the animal was a domestic dog or cat, was it

male or female?

12. If the animal was a domestic dog, was the animal in a restrained environment? What kind? (ie. leashed, in fenced yard, inside house)

13. If the animal was a domestic dog or cat, did the bite occur on the property of the owner?

14. If the animal was a domestic dog or cat, was the victim a member of the owner's family, a neighbor, or a stranger?

Review of Literature:

Human rabies transmission is a threat to every community in the United States. While the actual number of diagnosed human rabies cases is small, the potential for possible rabies exposure is much greater. Statistics indicate that since 1960, human rabies has averaged only one to two cases annually in the United States, while reported animal rabies has risen from 3,567 in 1960 to 4,319 in 1984. This figure peaked in 1981, when reports of animal rabies totaled 7,118.(16,17)

While domestic animal control programs have been instrumental in reducing domestic animal rabies, prevention of wild animal rabies has been less successful. U.S. statistics compiled from 1983 indicate that reported wild animal rabies is much more common than domestic animal rabies. In 1983 alone, there were 5,294 cases of wild animal rabies reported in the United States, compared to only 584 cases of domestic animal rabies.(22) This disproportionate ratio of wild animal rabies to domestic animal rabies is

primarily due to the lack of control man has over the wild animal population. Many authorities agree that although vaccination and other control methods for domestic animals reduces the number of human exposures to rabies, substantial control or elimination of rabies as a disease threat depends on what measures are taken in eliminating rabies in wildlife. To deal with this problem, increasing amounts of research has been conducted in the past twenty years on methods for reducing rabies among the wild animal reservoir. Countries that have been especially active in this field are Canada, the United States, Switzerland, West Germany and France. This research has centered on the development of an oral rabies vaccine which would be administered in the form of a bait. In trial tests, the vaccine appears to be most successful in those areas in which the fox is the target species.(6) Yet, much more remains to be done in this area before a solution to wild animal rabies is realized. In the meantime, since wild animals cannot be easily vaccinated, nor can they be easily identified and destroyed, the wild animal population continues to act as a ready reservoir for transmitting rabies to vulnerable animals and humans.

Presently, control of rabies transmission is achieved through use of community animal control measures, reduction of the wildlife reservoir through traps and poisons, quarantine of transported animals, education of the public, and also with the use of preventative vaccines (both human

and animal). Changes in this system should only be considered if supported by objective data.

Human rabies exposure is twofold in nature, involving both animals and man. This necessitates an examination of each. The literature is mainly comprised of research concerning actual human rabies exposures, or actual human rabies cases. Little substantial information has been collected on the specifics regarding actual animal rabies or animal attacks in this country. Only two studies were found in the literature that specifically focused on the animals involved in human rabies exposure. One of these studies was a case series, while the other was a population surveillance study. The case series study examined dog bite reports from a Navajo Reservation in Arizona.(9) While examination of rabies exposure was not performed in this study, the circumstances surrounding each animal bite was studied. The results of the study indicated that there were specific factors which were common among many of the attacks.

The second animal study concerned itself with the increase in raccoon rabies in the United States in recent years.(5) This study provided information on the changing geographic and species specific involvement of rabid wild animals in the United States since 1977.

Both of the animal studies stressed the need for increased attention and further research in the area of animal attacks on humans. In addition, other sources agree

that this area is one that warrants further study.(11,13,18)

Most of the information on human rabies exposures focuses on the human aspect of the problem. The literature indicates that most of the research on human rabies was done through the use of case report studies, population surveillance studies, and case series (observational). The case report studies attempt to examine specific human rabies exposure incidents. These were reported primarily by the CDC. The population surveillance studies attempt to examine both animal and human rabies exposure risks over a specific period of time. Five of these studies were found in the literature. Each covers a different aspect of rabies. The case series (observational) attempt to correlate common factors in transmission of rabies to humans. There was only one of these studies in the literature.

Case Report Studies:

In 1985, the Centers for Disease Control published a report that detailed the three human rabies cases that were reported in the United States during 1983.(22) In two of the cases, transmission from animal to human occurred outside of the United States. In both of these cases, the offending animals were the individual's own pet dogs. One attack occurred when the owner was bitten on the right wrist while freeing his dog from a trap. In this case, the dog reportedly had been immunized beforehand against rabies.

In the second case, a U.S. Peace Corps volunteer died

from rabies after being bitten by a puppy which was too young to be vaccinated. Since she had six months previously completed pre-exposure rabies prophylaxis, her rabies antibody level should have been therapeutic enough to protect her from the disease. However, postmortem study indicated that her rabies antibody level was not adequate. In a follow-up investigation, it was discovered that nine others immunized at the same time as her also had inadequate rabies antibody levels.(4) This case is the first documented failure of pre-exposure rabies prophylaxis (human diploid cell vaccine).

The third reported case occurred in the United States, when a 5 year old girl was suspected of being bitten by a bat. No information was provided on whether the attack was provoked.

The CDC report also tabulated the numbers of reported rabies cases in wild animals versus domestic animals, and cited both the species and geographic prevalence of rabid animals involved. The results of the study indicate that in the United States, the frequency of domestic animal rabies has declined from 1,082 cases in 1981 to 584 in 1983. For wild animal rabies, there was also a 5 percent decrease from 5,535 in 1982 to 5,294 in 1983. The species of animal involved in the majority of the wild animal cases were skunks, raccoons, and bats. For domestic animals, the number of rabies cases in cats in 1983 exceeded the number of rabies

cases for dogs for the third consecutive year.(22)

In 1985, the CDC also reported another human rabies case that had occurred during the year. In this case, investigators were unable to ascertain how the person was exposed to rabies. Since the diagnosis was made two months postmortem, and rabies was not suspected before death, it was difficult to get an accurate history on the exposure incident itself.(15)

Population Surveillance Studies:

Five population surveillance studies have been performed, which indicate the incidence of animal and human rabies cases for different time periods and different geographic areas. Two of these studies were conducted at military bases. One of the studies examined the occurrences of zoonoses in pet animals at 30 Air Force bases in nine regions of the United States during 1980 and 1981.(27) The study concluded that cats presented the most significant rabies exposure risk, especially those that were allowed to roam freely. The second military study was conducted at a U.S. Naval Facility in the Phillipines.(10) This study revealed that during 1984, 311 human rabies exposure cases occurred on the base. In the majority of these cases, the offending animal was a dog, and the attack was provoked.

The third population surveillance study described wild and domestic animal rabies in the United States during 1982.(7) The results of this study supported the results

published by the CDC in its 1983 study. In addition, it made specific recommendations for postexposure treatment.

The last two population surveillance studies examined reported human rabies cases in the United States covering the past four decades. One of the studies reported that from 1946 to 1973, 247 out of 250 human rabies cases resulted from animal bites.(21) The second study investigated the 38 reported U.S. human rabies cases from 1960 to 1979.(1) It concluded that the offending animal in the majority of exposures had changed from domestic animals in the 1940's, to wild animals in the 1970's. No information concerning the individual attacks was provided.

Case Series (Observational):

The one case series study examined 23 human rabies cases reported to the CDC from 1975 through 1984.(14) Forty three percent of these cases were acquired outside of the United States. In 8 of these cases the offending animal was a dog. No further information was provided on the specific exposures.

Summary:

Are there factors on an animal bite report that can be ascertained for use in the prevention of human rabies exposure? Based on the information available, the answer is probably yes. Certainly there exists a real potential for human rabies exposure. The number of human rabies cases that can be traced to an animal bite support this. Furthermore,

the case studies prove that, in many cases, domestic animals have spread the rabies virus to humans. On the other hand, the population surveillance studies provide reassurances that domestic animal rabies has decreased over the years.

Although it presently appears that the risk of human exposure to rabies is small, the literature supports an escalation of the situation involving wild animal rabies. This, in turn, will negatively impact on domestic animals. Since domestic animals are kept in close proximity to man, the danger for human rabies exposure will continue. Thus, from the information available, it would seem impossible to conclude that the risk is insignificant.

In addition, the literature also indicates that there are several factors which are common to rabies exposure from animals to man. Some of these factors include:

- 1) Even though wild animal rabies is more prevalent than domestic animal rabies, many of the human rabies exposures are from domestic animals.
- 2) Many of these reported attacks are provoked.
- 3) While rabies endemic areas have a higher rabies risk, areas of low animal rabies incidence are also at risk.
- 4) Each study area had characteristics unique and specific to itself which influenced the rabies exposure.
- 5) There is a general lack of specific information concerning the circumstances of many of the attacks.

These factors illustrate the importance of defining the circumstances surrounding the attack. It is the specific aim of this study to ascertain the frequency of reported

potential human rabies exposures from wild animals as compared to that from domestic animals, and to examine other factors involved in these exposures. By understanding the complexity of factors inherent in potential human rabies exposures, effective and efficient animal control measures can be designed and implemented for a community.

CHAPTER II

Methodology:

In ascertaining the frequency of reported potential human rabies exposure from wild versus domestic animals, examination of data utilizing a case series (observational) appears to be the most appropriate tool available. This type of study is also appropriate for identifying possible contributing factors. Through the use of this design, examination of specific factors related to potential human rabies exposure can be conducted in a pre-determined community over an extended period of time.

The population under study will be the residents of San Antonio, Texas and unincorporated Bexar County. In 1982, the U.S. Bureau of Census reported that this community had a population of 1,047,668.(26) The source of information utilized in this study will be the animal bite reports which are held on file at the Metropolitan Health District in San Antonio, Texas. This agency is responsible for the control and prevention of rabies in San Antonio, Texas and unincorporated Bexar County. Its duties include securing biting animals for rabies observation, capturing stray animals, investigating incidences of animal to human bites,

and coordinating an annual rabies vaccination drive.

It also enforces the City Animal Control Ordinances.(29)

Once the animal bite reports are obtained from the Metropolitan Health District, their content will be reviewed with emphasis placed on the circumstances of the attack and the offending animal involved. Specific factors which will be examined include whether the offending animal was domestic or wild, the species of the offending animal, whether the attack was provoked, how the individual was exposed, what area of the body was affected in the attack, the age of the individual, the gender of the individual, and whether the offending animal was found rabid. In addition, any evaluation of specific bite reports performed by the Metropolitan Health District will be examined. This information will then be recorded on a self-designed checklist to be later entered on a computer data base (software to be selected at a future date).

In order to avoid the bias that may occur from too limited a number of animal bite reports, six thousand records will be reviewed covering a three year period of time. Since San Antonio generates between 2,000 and 3,000 animal bite reports per year, this three year period of time (pre-set from 1983 thru 1985) will constitute the case series. A self designed checklist will be utilized by a three man research team to evaluate the contents of the reports for the selected three year period (1983-1985).

Since the animal bite report system is a passive system, actual results from the evaluation may be biased. This is due to the fact that an unknown number of animal to human attacks annually occur and are not reported. As a result the case series will most probably be underestimated. Therefore, the results of the study will reflect the same trend. There appears to be no effective way to eliminate this source of bias. In addition, although this factor warrants study consideration, it is beyond the scope of this present proposal.

No names, addresses, medical, or other individually identifying information of any kind concerning any of the subjects in this study will be used in compiling or analyzing the data, which will guarantee confidentiality of all the information gathered.

CHAPTER III

Study Validity and Reliability:

Prior to beginning field work of this study, the three man research team (plus the secretary) will review the objectives and specifics of the study. This will be performed to insure that no discrepancies exist in evaluating the data. To test consistency, each member of the research team will independently score 20 hypothetical records. The results of this test will then be evaluated by the research coordinator, and inconsistencies reviewed with the research team. The goal of this exercise is to obtain 100 percent reliability. This procedure will be repeated until total consistency among team members exists. In addition, during the field work phase, the research coordinator will randomly double check the finished checklists to determine if the research assistants understand how to correctly complete the checklists.

When the study data is later encoded onto the computer data base, the software utilized will require the operator to enter the information twice before accepting it. This will aid in avoiding possible data encoding errors, and thus enhance accuracy and reliability.

Analysis of Data:

Analysis of data will generate a percentage score and a raw number score for each category. The accumulative profile of animal bite reports can then be ascertained. This process will be performed utilizing a software package and an IBM PC-AT computer. Tables highlighting the results will be prepared. These tables will contain information on the following categories:

1. total number of human exposures from wild animals.
2. total number of human exposures from domestic animals.
3. total number of attacks provoked by human.
4. total number of attacks unprovoked.
5. total number of attacks per body part.
6. total number of exposures per bite, scratch, or contact with saliva.
7. total number of exposures per species.
8. total number of rabid animals per species.
9. total number of rabid animals.
10. total number of vaccinated animals (for rabies) per species.
11. total number of animals not vaccinated (for rabies) per species.
12. total number of victims previously vaccinated.
13. total number of victims not previously vaccinated.
14. total number of victims advised to get vaccinated.
15. total number of victims that received post-exposure prophylaxis.
16. total number of victims that chose to not receive post-exposure prophylaxis.
17. if the animal was a domestic dog, a breakdown by breed.
18. if the animal was a domestic dog, a breakdown by size.(small or large)
19. if the animal was a domestic dog or cat, was it male or female.
20. if the animal was a domestic dog, was the animal leashed.
21. if the animal was a domestic dog or cat, a breakdown by where the bite occurred.(in fenced yard, inside house, other)
22. if the animal was a domestic dog or cat, was the victim a member of the owner's family, a neighbor,

or a stranger.
23. total number of victims.
24. victim's age by five year categories.

By calculating the percentages and raw scores for each category, information concerning potential human rabies exposure can be ascertained. This information can be used to understand what factors are directly associated (cause-specific) with potential human rabies exposure.

Results:

Chapter two described the methods for gathering the data. By examination of the percentage score and the raw number score for each category, a table for each category can be set up. This will be done for each year and, also, as a whole.

Expectations for Results:

Since I am dealing with the whole population and not a sample of that population, percentage scores and raw number scores will be utilized. Tables will be designed for each category of data.(9,10)

The actual occurrence of rabies is a relatively rare event. Rates based upon rare events should be interpreted with an amount of caution. Unless the rates are based on a large enough sample, the chance variation of only a few cases of rabies may cause fluctuations in the rate. Therefore, confidence intervals of 95-percent will be calculated. This is a technique to aid with estimation of the amount of fluctuation of the observed rate in relation to the "true"

rate. The 95-percent confident interval is defined as the range around an observed rate in which there is a 95-percent probability of including the "true" rate.(19)

CHAPTER IV

Discussion:

Human rabies continues to be a serious and deadly disease in many parts of the world. Only three cases of humans surviving rabies have ever been cited in the literature.(12) Thus, although much is known about rabies, treatment of the disease itself remains mainly supportive. By the time clinical diagnosis (by lab test) is accomplished, the disease has usually advanced to a terminal stage, and treatment consists of maintaining life by use of modern intensive care units.(1)

Since effective treatment of human rabies is so limited, emphasis must be placed on prevention. This involves liberally treating human rabies exposures with a regimen of human rabies vaccine. However, in 1983, two separate cases were reported in which the vaccines utilized failed to provide adequate protection to those exposed to the rabies virus. In both these cases, the individuals died from the disease.(3) This suggests that alternative methods of preventing human rabies need to be developed and implemented in order to minimize initial human exposure to rabies.

If we can prevent human rabies exposure, it follows

that we will be able to prevent rabies. Therefore, a better understanding of these exposures is needed. The literature indicates that most studies on rabies are concerned with actual human rabies and actual animal rabies. However, these studies do not directly examine the factors which surround the rabies exposure itself. Since a direct relationship exists between animal bites and human rabies, examination of these exposures are necessary.(21) From the literature, a number of factors concerning the exposure have been noted. These factors are listed in chapter I. Since each reported animal bite is recorded on an animal bite report and other associated records (identifiable by a unique code number), examination of these factors is possible. That is the purpose of this study.

The population used in this study will be the residents of San Antonio, Texas and unincorporated Bexar County. Because of its geographic location, it is expected that the vast majority of wild rabid animals found will be bats and skunks.(23,25) It is also expected that a few domestic dogs and cats will be found rabid. This is due to the fact that many domestic animals in this area have not been vaccinated for rabies. Estimates by local health officials put the number of vaccinated pets at less than 12 percent.(25)

As the area also has some agricultural livestock, the possibility of rabies occurring in these animals cannot be

ruled out. As recently as March 1986, there was a domestic animal rabies case in nearby Medina County that involved a rabid lamb that had been infected by a skunk. As a result, eleven people, including a four month old baby, required the rabies vaccine.(23)

Within the past few years, the potential for human rabies exposures in the San Antonio area has risen considerably. In 1984, 3,308 animals were quarantined for rabies observation. Thus far in 1986 (as of the end of March), there have been 3,105 animals quarantined for rabies observation. A direct relationship can be noted among these figures and the number of animals euthanized. While 33,815 animals were euthanized in 1984, thus far in 1986 there have been 54,766 animals euthanized.(2,29) Since most of the euthanized animals were strays which roamed freely, the potential for rabies among these animals is higher. This, in turn, greatly impacts on human rabies exposures, as these domestic strays maintain close proximity to human populated areas.

It is expected that this study can be utilized by the selected community to ascertain and better understand the complexity of factors that surround human rabies exposure. The study results may suggest alternatives and/or improvements to the area's present animal control program, and provide a guide to improving public education on this subject.

CHAPTER V

Conclusions and Recommendations:

It is the specific purpose of this study to ascertain the frequency of reported human rabies exposure from wild animals as compared to that from domestic animals, and to examine other factors involved in these exposures.

Examination of the literature concerning both wild and domestic animal attacks notes specific similarities and differences between the two types of attacks exist. It is therefore expected that completion of this study would reinforce these trends. From this study, a better understanding of the complexity of factors inherent in human rabies exposures can be ascertained. Once this has been achieved, effective and efficient animal control measures may be designed and implemented for a community. Also, public education measures can be designed and implemented. The results may suggest avenues for future investigation which might prove to be useful.

I expect there will be no evidence that the results were artifactual, but the possibility cannot be entirely excluded. Routine analysis of animal bite reports at annual intervals might prove to be useful. In this way, any change

in the nature of human rabies exposures can be dealt with as soon as possible.

Appendix 1: Definition of Terms.

1. Potential human rabies exposure--those cases reported to the public health department for rabies follow-up. Possible exposure occurs when a person is bitten, scratched, attacked, or contacted by an animal that could possibly carry the rabies virus.
2. Provoking an attack--occurs if a person is physically touching the animal or taunting it with deliberate gestures.
3. Body part--the hand (wrist to fingers); lower arm (elbow to wrist); upper arm (shoulder joint to elbow); foot (toes to ankle); lower leg (knee to ankle); upper leg (hip to knee); buttocks; and the head and neck areas.
4. Species--the type of animal involved (ie. cat, dog, fox, raccoon, skunk, or rodent), and whether the animal is domestic or wild.
5. Domestic animal--animals commonly kept as pets and/or in close association with people.
6. Wild animal--those animals living in a state of nature, and which are not domesticated.
7. Rabid animal--an animal proven rabid by fluorescent antibody lab test.

Appendix 2: Budget of Time and Resources

The time table for the proposed study is as follows:

January 1987:

1. Grantor will appoint research coordinator.
2. Research coordinator will obtain permission from the Metropolitan Health District and the governing political body to conduct this study.
3. Plan hiring of research staff and computer consultant. Advertise the job opportunities.
4. Lease office space for three staff workers and one secretary.
5. Set up office.
6. Interview applicants.

February 1987:

1. Hire personnel.
2. ALL the staff will read the proposal in detail. Questions will be answered.
3. ALL four staff members will evaluate the hypothetical records using the data checklist form.

March-September 1987:

1. Review the animal bite reports at the Metropolitan Health District in San Antonio, Texas. Record results on the data checklist.

October 1987:

1. Tabulate the data onto a computer data base.
2. Compute raw data and percentages.

November 1987:

1. Examination of data.
2. Write rough drafts of results.

December 1987:

1. Write final report of findings.
2. Submit paper for publication.
3. Write letters of appreciation and recommendation for the staff.
4. Close office.

Personnel and Funds Required:

1. A research coordinator, two research assistants, and a secretary/receptionist are needed. A computer consultant is also needed to help select an appropriate software package and teach all four staff members how to utilize it.

2. Equipment needed is as follows:

desks and chairs for four people, one big comfortable couch, one three drawer file cabinet, two telephone lines, one IBM PC-AT computer with 640k and two disc drives, an appropriate software package (to be selected at a later date), printer, computer printer paper, two typewriters, stapler, and a coffee machine.

3. Supplies needed are as follows:

writing equipment (pencils, pens, etc.), Webster's Dictionary, stationary, postage, miscellaneous small office supplies, and a large amount of coffee.

Appendix 3: Animal Bite Report Checklist

Checklist

1. Animal Bite Report # _____
2. Is the offending animal domestic, wild, unknown, or unreported?
3. What species of animal was involved in the attack?
Not noted?
4. If the animal was a domestic dog, what breed was it?
Was it large or small?
5. If the animal was a domestic dog or cat, was the animal male or female?
6. What body part was involved in the attack?
Head and neck, hand, lower arm, upper arm, buttocks, foot, lower leg, upper leg.
7. Was the attack provoked or unprovoked?
8. How was the individual exposed?
9. Was the animal found and examined? Kept for observation? Found rabid?
10. Was the animal currently vaccinated (for rabies)?
11. If the animal was a domestic dog, was the animal leashed?

12. If the animal was a domestic dog or cat, was the animal in a fenced yard, inside the house, or other location? Please specify.
13. If the animal was a domestic dog or cat, did the bite occur on the property of the owner?
14. If the animal was a domestic dog or cat, was the victim a member of the owner's family, a neighbor or a stranger?
15. Victim's age last birthday?
16. Victim's gender? male or female?
17. Was the victim currently vaccinated (for rabies)?
18. Any other information relevant to the attack:

Appendix 4: Sample letter to be sent to the Metropolitan Health District

School of Public Health
University of Texas
Health Science Center
San Antonio, Texas

Dear Sir,

I wish to conduct a study to measure those factors common in human rabies exposure. In order to do this, I would like to form a database of a three year group of animal bite reports of the Metropolitan Health District and ascertain those factors in common. I would like your permission to utilize these records. My research assistants and I will observe the strictest confidentiality concerning your records.

Thank you in advance for your cooperation.

Stephen C. Goodell
Study Director

Appendix 5: Photostat copy of the animal bite report that is presently used by the Metropolitan Health District.

ANIMAL BITE REPORT

1. CITY _____
2. COUNTY _____

BIBLIOGRAPHY

1. Anderson, Larry J., M.D.; Nicholson, Karl G., M.B.; Tauxe, Robert V., M.D.; and Winkler, William G., D.V.M. "Human Rabies in the United States, 1960 to 1979: Epidemiology, Diagnosis, and Prevention." Annals of Internal Medicine 100 (May 1984): 728-735.
2. "Animal Control Statistics." San Antonio Light, April 19, 1986, B2.
3. "Annual Summary-1983." Morbidity And Mortality Weekly Report 32 (December 1984): 114-119.
4. Bernard, Kenneth W., Fishbein, Daniel B., Miller, Kirk D., Parker, Robert A., Waterman, Sheila, Sumner, John W., Reid, Frances L., Johnson, Bruce K., Rollins, Arthur J., Oster, Charles N., Schonberger, Lawrence B., Baer, George M., and Winkler, William G., "Pre-Exposure Rabies Immunization With Human Diploid Cell Vaccine: Decreased Antibody Responses In Persons Immunized In Developing Countries." American Journal of Tropical Medicine and Hygiene 34 (May 1985): 633-647.
5. Cappucci, Dario T. Jr., Beatrice, Michael G., Aukward, Monica E., Broome, Rosemary L., and Beaulieu, Andrew J., "Highlights on Rabies, Including Mid-Atlantic States Outbreak in Raccoons." Military Medicine 151 (January 1986): 1-7.
6. Charlton, K.M., Webster, W.A., Casey, G.A., Rhodes, A.J., Macinnes, C.D., and Lawson, K.F., "CVMA Convention 1985: Recent Advances in Rabies Diagnosis and Research." Canadian Veterinary Journal 27 (February 1986): 85-88.
7. Collins, Terrence R., M.D., M.P.H., and Burridge, M. J., B.V.M., M.P.V.M., PH.D. "Rabies Prophylaxis." American Family Physician 29 (March 1984): 295-300.

8. "Compendium of Animal Rabies Vaccines, 1985 Prepared By: The National Association of State Public Health Veterinarians, Inc." Morbidity And Mortality Weekly Report 33 (January 4, 1985): 714-725.
9. Daniels, Thomas J., "A Study of Animal Bites on the Navajo Reservation." Public Health Reports 101 (January-February 1986): 50-59.
10. Dembert, Mark L., M.D., M.P.H.; Lawrence, Wade B., D.V.M.; Weinberg, Winkler G., M.D.; Granger, David, M.D.; Sanderson, Roy D., M.P.H., M.S.; Garst, Paul D., M.D.; Eighmy, Johnnie J., D.V.M., M.S.; and Wells, Tommy E., M.N. "Epidemiology of Human Rabies Post-Exposure Prophylaxis at the U.S. Naval Facility, Subic Bay, Phillipines." American Journal of Public Health 75 (December 1985): 1440-1441.
11. Flanigan, Timothy J., D.D.S., Rippert, Eric T., D.M.D., and Nieusma, Gerald E., D.D.S. "Rabies Therapy for Animal Bites in the Head and Neck Region." Journal of Oral and Maxillofacial Surgery 43 (September 1985): 704-706.
12. Gordon, Emanuel K., M.D., Brill, James C., M.D., and Geiderman, Joel M., M.D., "Immunophylaxis in the Emergency Department." Topics In Emergency Medicine 4 (April 1982): 82-94.
13. Hawkins, James, M.D., Paris, Paul M., M.D., Stewart, R.D., M.D., "Mammalian bites: Rational approach to management." Postgraduate Medicine 73 (June 1983): 52-62.
14. "Human Rabies Acquired Outside the United States." Morbidity And Mortality Weekly Report 34 (May 3, 1985): 235-237.
15. "Human Rabies Diagnosed 2 Months Postmortem-Texas." Morbidity And Mortality Weekly Report 34 (November 22, 1985): 700-707.
16. "Incidence Tables." Morbidity And Mortality Weekly Report 33 (January 4, 1985): 720.
17. "Incidence Tables." Morbidity And Mortality Weekly Report 34 (October 25, 1985): 648.
18. Klein, Michael, M.D., "Nondomestic Mammalian Bites" American Family Physician 32 (November 1985): 137-141.

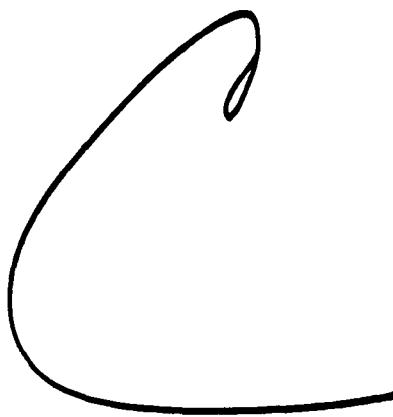
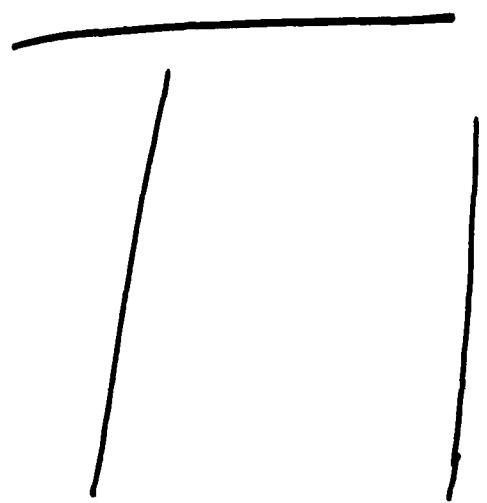
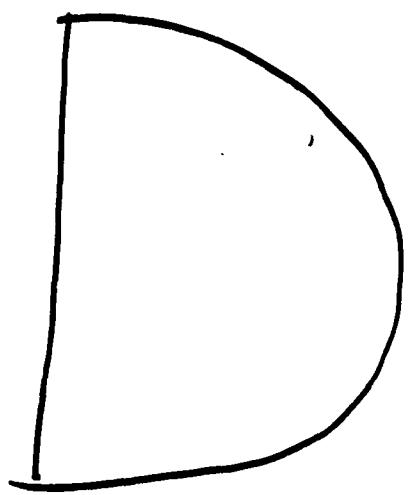
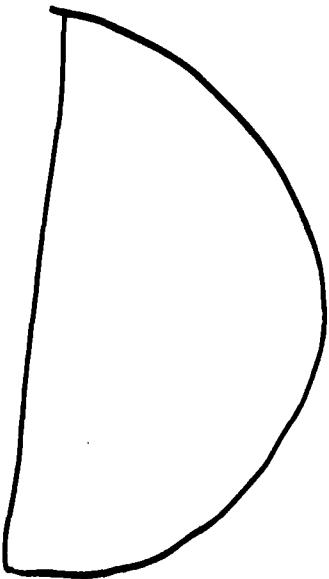
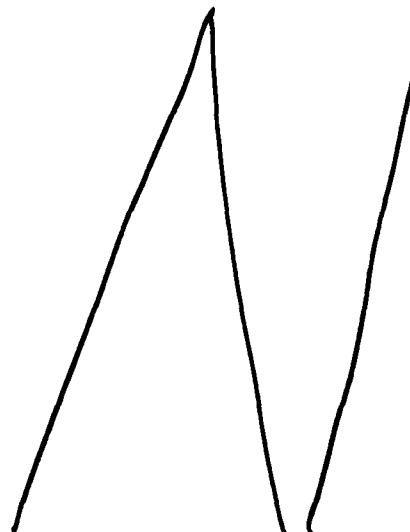
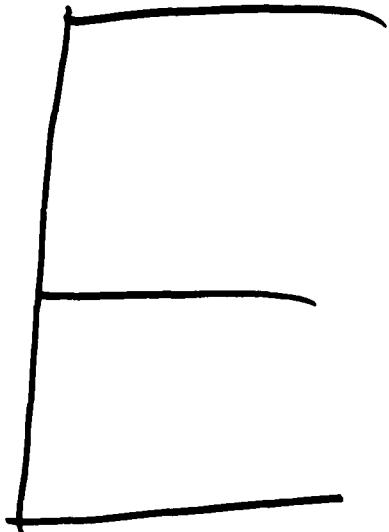
19. Kuzma, Jan W., Basic Statistics for the Health Sciences. 1st ed. Mayfield Publishing Company, 1984.
20. Last, John M., M.D., D.P.H., ed. Public Health and Preventive Medicine. 11th ed. New York: Appleton-Century-Crofts, 1980.
21. Mann, Jonathan M., M.D., M.P.H. "Routine Pre-Exposure Rabies Prophylaxis: A Reassessment." American Journal of Public Health 74 (July 1984): 720-722.
22. "Rabies in the United States and Canada, 1983." Morbidity And Mortality Weekly Report 34 (December 10, 1985): 11ss-19ss.
23. "Rise in Rabies Among Wildlife Prompts Alert." San Antonio Light, April 10, 1986, A1.
24. The National Association of State Public Health Veterinarians, Inc. "Compendium of Animal Rabies Vaccines, 1986." Morbidity and Mortality Weekly Report 34 (January 3, 1986): 770-781.
25. "Thirteen Children Risk Rabies in Bat Games." San Antonio Light, October 26, 1985, B1.
26. U.S. Bureau of Census. 1980 Census of Population. Vol. 1: Characteristics of the Population. Chapter C, Part 45, table 56. Washington D.C.: Government Printing Office, 1982.
27. Warner, Ronald D., D.V.M., M.P.V.M., "Occurrence and Impact of Zoonoses in Pet Dogs and Cats at U.S. Air Force Bases." American Journal of Public Health 74 (November 1984): 1241-1242.
28. "World Survey of Rabies." Bulletin of the World Health Organization 63 (January 1985): 4587.
29. "Your Health Our Concern." San Antonio Metropolitan Health District 1984.

VITA

Stephen Curtis Goodell was born in Detroit, Michigan, on July 12, 1951, the son of Curtis Hammond Goodell and Elsie Hodgdon Goodell. He received the degree of Bachelor of Science in Nursing from Western Connecticut State University in June 1981 and was commissioned as a second lieutenant in the United States Air Force Nurse Corps. After spending four years at Wilford Hall USAF Medical Center in San Antonio, Texas, he entered the Air Force Institute of Technology program and began graduate studies at the University of Texas. In 1981 he married Sheila West of Brookfield Center, Connecticut. They have two sons, Paul, age 21 months, and Kevin, age 4 weeks.

Permanent address: 5427 Timber Canyon
San Antonio, Texas 78250

This project was typed by Sheila and Stephen Goodell.



9- 86